LEATHER VARNISH:
See Varnish.

LEATHER WATERPROOFING:
See Waterproofing.

LEMONS:
See also Essences, Extracts, and Fruits.

Preservation of Fresh Lemon Juice.—The fresh juice is cleared by gently heating it with a little egg albumen, without stirring the mixture. This causes all solid matter to sink with the coagulated white, or to make its way to the surface. The juice is then filtered through a woolen cloth and put into bottles, filled as full as possible, and closed with a cork stopper, in such a way that the cork may be directly in contact with the liquid. Seal at once and keep in a cool place. The bottles should be asepticized with boiling water just before using.

LEMON EXTRACT (ADULTERATED), TESTS FOR:
See Foods.

LEMON SHERBET POWDER:
See Salts, Effervescent.

LEMONADES, LEMONADE POWDERS, AND LEMONADE DROPS:
See Beverages.

LEMONADE POWDER:
See Salts, Effervescent.

LENSES AND THEIR CARE:

Unclean Lenses (see also Cleaning Preparations and Methods).—If in either objective or eyepiece the lenses are not clean, the definition may be seriously impaired or destroyed. Uncleanliness may be due to finger marks upon the front lens of the objective, or upon the eyepiece lenses; dust which in time may settle upon the rear lens of the objective or on the eye lens; a film which forms upon one or the other lens, due occasionally to the fact that glass is hygroscopic, but generally to the exhalation from the interior finish of the mountings, and, in immersion objectives, because the front lens is not properly cleaned; or oil that has leaked on to its rear surface, or air bubbles that have formed in the oil between the cover glass and front lens.

Remedy.—Keep all lenses scrupulously clean. For cleaning, use well-washed linen (an old handkerchief) or Japanese lens paper.

Eyepieces.—To find impurities, revolve the eyepieces during the observation; breathe upon the lenses, and wipe gently with a circular motion and blow off any particles which may adhere.

Dry Objectives.—Clean the front lens as described. To examine the rear and interior lenses use a 2-inch magnifier, looking through the rear. Remove the dust from the rear lens with a camel's-hair brush.

Oil Immersion Objectives.—Invariably clean the front lens after use with moistened linen or paper, and wipe dry.

In applying oil examine the front of the objective with a magnifier, and if there are any air bubbles, remove them with a pointed quill, or remove the oil entirely and apply a fresh quantity.

LETTERS, TO REMOVE FROM CHINA:
See Cleaning Preparations and Methods, under Miscellaneous Methods.

LETTER-HEAD SENSITIZERS:
See Photography, under Paper-Sensitizing Processes.

Lettering

CEMENTS FOR ATTACHING LETTERS ON GLASS:
See Adhesives, under Sign-Letter Cements.

Gold Lettering.—This is usually done by first drawing the lettering, then covering with an adhesive mixture, such as size, and finally applying gold bronze powder or real gold leaf. A good method for amateurs to follow in marking letters on glass is to apply first a coat of whiting, mixed simply with water, and then to mark out the letters on this surface, using a pointed stick or the like. After this has been done the letters may easily be painted or gilded on the reverse side of the glass. When done, wash off the whiting from the other side, and the work is complete.

Bronze Lettering.—The following is the best method for card work: Write with asphaltum thinned with turpentine until it flows easily, and, when nearly dry, dust bronze powder over the letters. When the letters are perfectly dry tap the card to take off the extra bronze, and it will leave the letters clean and sharp. The letters should be made with a camel's-hair brush and not with the automatic pen, as oil paints do not work satisfactorily with these pens.

For bronzed letters made with the pen, use black letterine or any water color.

If a water color is used add considerable gum arabic. Each letter should be bronzed as it is made, as the water color dries much more quickly than the asphaltum.

Another method is to mix the bronze powder with bronze sizing to about the consistency of the asphaltum. Make the letter with a camel's-hair brush, using the bronze paint as one would any oil paint.

This method requires much skill, as the gold paint spreads quickly and is apt to flood over the edge of the letter. For use on oilcloth this is the most practical method.

Bronzes may be purchased at any hardware store. They are made in copper, red, green, silver, gold, and copper shades.

Lettering on Glass.—White lettering on glass and mirrors produces a rich effect. Dry zinc, chemically pure, should be used. It can be obtained in any first-class paint store and is inexpensive. To every teaspoonful of zinc, 10 drops of mucilage should be added. The two should be worked up into a thick paste, water being gradually added until the mixture is about the consistency of thick cream. The paint should then be applied with a camel's-hair brush.

Another useful paint for this purpose is Chemnitz white. If this distemper color is obtained in a jar, care should be exercised to keep water standing above the color to prevent drying. By using mucilage as a sizing these colors will adhere to the glass until it is washed off. Both mixtures are equally desirable for lettering on block card-board.

Any distemper color may be employed on glass without in any way injuring it. An attractive combination is—first to letter the sign with Turkey red, and then to outline the letters with a very narrow white stripe. The letter can be rendered still more attractive by shading one side in black.

Signs on Show Cases.—Most show cases have mirrors at the back, either in the form of sliding panels or spring doors. Lettering in distemper colors on these mirrors can easily be read through the fronts or tops of cases. If the mirror is on a sliding panel, it will be necessary to detach it from the case in order to letter it. When the mirror is on a spring door the sign can be lettered with less trouble.

By tracing letters in chalk on the outside of the glass, and then painting them on the inside, attractive signs can be produced on all show cases; but painting letters on the inside of a show case glass is more or less difficult, and it is not advisable to attempt it in very shallow cases.

"Spatter" Work.—Some lettering which appears very difficult to the uninitiated is, in fact, easily produced. The beautiful effect of lettering and ornamentation in the form of foliage or conventional scrolls in a speckled ground is simple and can be produced with little effort. Pressed leaves and letters or designs cut from newspapers or magazines may be tacked or pasted on cardboard or a mat with flour paste. As little paste as possible should be used—only enough to hold the design in place. When all the designs are in the positions desired, a toothbrush should be dipped in the ink or paint to be employed. A toothpick or other small piece of wood is drawn to and fro over the bristles, which are held toward the sign, the entire surface of which should be spattered or sprinkled with the color. When the color is dry the designs pasted on should be carefully removed and the paste which held them in place should be scraped off. This leaves the letters and other designs clean cut and white against the "spatter" background. The beginner should experiment first with a few simple designs. After he is able to produce attractive work with a few figures or letters he may confidently undertake more elaborate combinations.

Lettering on Mirrors.—From a bar of fresh common brown soap cut off a one-inch-wide strip across its end. Cut this into 2 or 3 strips. Take one strip and with a table-knife cut from two opposite sides a wedge-shaped point resembling that of a shading pen, but allow the edge to be fully $\frac{1}{8}$ inch thick. Clean the mirror thoroughly and proceed to letter in exactly the same manner as with a shading pen.

To Fill Engraved Letters on Metal Signs.—Letters engraved on metal may be filled in with a mixture of asphaltum, brown japan, and lampblack, the mixture being so made as to be a putty-like mass. It should be well pressed down with a spatula. Any of the mass adhering to the plate about the edges of the letters is removed with turpentine, and when the cement is thoroughly dried the plate may be polished.

If white letters are desired, make a putty of dry white lead, with equal parts of coach japan and rubbing varnish. Fill the letters nearly level with the sur-

face, and when hard, apply a stout coat of flake white in japan thinned with turpentine. This will give a clean white finish that may be polished.

The white cement may be tinted to any desired shade, using coach colors ground in japan.

Tinseled Letters, or Chinese Painting on Glass.—This is done by painting the groundwork with any color, leaving the letter or figure naked. When dry, place tin foil or any of the various colored copper foils over the letters on the back of the glass, after crumpling them in the hand, and then partially straightening them out.

LICE KILLERS:

See Insecticides.

LICHEN REMOVERS:

See Cleaning Preparations and Methods, under Miscellaneous Methods and Household Formulas.

LICORICE:

Stable Solutions of Licorice Juice.—A percolator, with alternate layers of broken glass, which have been well washed, first with hydrochloric acid and plentifully rinsed with distilled water, is the first requisite. This is charged with pieces of crude licorice juice, from the size of a hazel nut to that of a walnut, which are weighted down with well-washed pebbles. The percolate is kept for 3 days in well corked flasks which have been rinsed out with alcohol beforehand. Decant and filter and evaporate down rapidly, under constant stirring, or *in vacuo*. The extract should be kept in vessels first washed with alcohol and closed with parchment paper, in a dry place—never in the cellar.

To dissolve this extract, use water, first boiled for 15 minutes. The solution should be kept in small flasks, first rinsed with alcohol and well corked. If to be kept for a long time, the flasks should be subjected for 3 consecutive days, a half hour each day, to a stream of steam, and the corks paraffined.

There is frequently met with in commerce a purified juice that remains clear in the *mixtura solvens*. It is usually obtained by supersaturation with pure ammonia, allowing to stand for 3 days, decanting, filtering the decanted liquor, and quick evaporation. Since solutions with water alone rapidly spoil, it is well to observe with them the precautions common for narcotic extracts.

To Test Extract of Licorice.—Mere solubility is no test for the purity of extract of licorice. It is, therefore, proposed to make the glycyrrhizin content and the nature of the ash the determining test. To determine the glycyrrhizin quantitatively proceed as follows: Macerate $\frac{1}{10}$ ounce of the extract, in coarse powder, in 10 fluidounces distilled water for several hours, with more or less frequent agitation. When solution is complete, add 10 fluidounces alcohol of 90 per cent, filter and wash the filter with alcohol of 40 per cent until the latter comes off colorless. Drive off the alcohol, which was added merely to facilitate filtration, by evaporation in the water bath; let the residue cool down and precipitate the glycyrrhizin by addition of sulphuric acid. Filter the liquid and wash the precipitate on the filter with distilled water until the wash water comes off neutral. Dissolve the glycyrrhizin from the filter by the addition of ammonia water, drop by drop, collecting the filtered solution in a tared capsule. Evaporate in the water bath, dry the residual glycyrrhizin at 212° F., and weigh. Repeated examinations of known pure extracts have yielded a range of percentage of glycyrrhizin running from 8.06 per cent to 11.90 per cent. The ash should be acid in reaction and a total percentage of from 5.64 to 8.64 of the extract.

LIGHT, INACTINIC:

See Photography.

LIGNALOE SOAP:

See Soap.

LIMEADE:

See Beverages, under Lemonades.

LIME AS A FERTILIZER:

See Fertilizers.

LIME, BIRD.

Bird lime is a thick, soft, tough, and sticky mass of a greenish color, has an unpleasant smell and bitter taste, melts easily on heating, and hardens when exposed in thin layers to the air. It is difficult to dissolve in alcohol, but easily soluble in hot alcohol, oil of turpentine, fat oils, and also somewhat in vinegar. The best quality is prepared from the inner green bark of the holly (*Ilex aquifolium*), which is boiled, then put in barrels, and submitted for 14 days to slight fermentation until it becomes sticky. Another process of preparing it is to mix the boiled bark with juice of mistletoe berries and burying it in the ground until

fermented. The bark is then pulverized, boiled, and washed. Artificial bird lime is prepared by boiling and then igniting linseed oil, or boiling printing varnish until it is very tough and sticky. It is also prepared by dissolving cabinet-makers' glue in water and adding a concentrated solution of chloride of zinc. The mixture is very sticky, does not dry on exposure to the air, and has the advantage that it can be easily washed off the feathers of the birds.

LIME JUICE:
See Essences and Extracts

LIME-JUICE CORDIAL:
See Wines and Liquors.

LIME WAFERS:
See Confectionery.

LINEN, TO DISTINGUISH COTTON FROM:
See Cotton.

LINEN DRESSING:
See Laundry Preparations.

LINIMENTS:
See also Ointments.

For external use only.—I.—The following penetrating oily liniment reduces all kinds of inflammatory processes:

Paraffine oil.....	4 ounces
Capsicum powder....	½ ounce

Digest on a sand bath and filter. To this may be added directly the following: Oil of wintergreen or peppermint, phenol, thymol, camphor or eucalyptol, etc.

II.—Camphor.....	2 ounces
Menthol.....	1 ounce
Oil of thyme.....	1 ounce
Oil of sassafras.....	1 ounce
Tincture of myrrh..	1 ounce
Tincture of capsicum	1 ounce
Chloroform.....	1 ounce
Alcohol.....	2 pints

LINIMENTS FOR HORSES:
See Veterinary Formulas.

LINOLEUM:
See also Oilcloth.

Composition for Linoleum, Oilcloth, etc.—This is composed of whiting, dried linseed oil, and any ordinary dryer, such as litharge, to which ingredients a proportion of gum tragacanth is to be added, replacing a part of the oil and serving to impart flexibility to the fabric, and to the composition in a pasty mass the property of drying more rapidly. In the production of linoleum, the whiting is replaced in whole or in part by pulverized cork. The proportions are approximately the following by weight: Whiting or powdered cork, 13 parts; gum tragacanth, 5 parts; dried linseed oil, 5½ parts; siccative, ½ part.

Dressings for Linoleum.—A weak solution of beeswax in spirits of turpentine has been recommended for brightening the appearance of linoleum. Here are some other formulas:

I.—Palm oil.....	1 ounce
Paraffine.....	18 ounces
Kerosene.....	4 ounces

Melt the paraffine and oil, remove from the fire and incorporate the kerosene.

II.—Yellow wax.....	5 ounces
Oil turpentine.....	11 ounces
Amber varnish.....	5 ounces

Melt the wax, add the oil, and then the varnish. Apply with a rag.

Treatment of Newly Laid Linoleum.—The proper way to cleanse a linoleum flooring is first to sweep off the dust and then wipe up with a damp cloth. Several times a year the surface should be well rubbed with floor wax. Care must be had that the mass is well pulverized and free from grit. Granite linoleum and figured coverings are cleansed without the application of water. A floor covering which has been treated from the beginning with floor wax need only be wiped off daily with a dry cloth, either woolen or felt, and afterwards rubbed well with a cloth filled with the mass. It will improve its appearance, too, if it be washed several times a year with warm water and a neutral soap.

LINOLEUM, CLEANING AND POLISHING:
See Household Formulas.

LINOLEUM ON IRON STAIRS OR CEMENT FLOORS, TO GLUE:
See Adhesives, under Glues.

LINSEED OIL:
See also Oils.

Bleaching of Linseed Oil and Poppyseed Oil.—In order to bleach linseed oil and poppyseed oil for painting purposes, thoroughly shake 2.5 parts of it in a glass vessel with a solution of potassium permanganate, 50 parts, in 1,250 parts of water; let stand for 24 hours in a warm temperature, and then mix with 75 parts of pulverized sodium sulphite. Now shake until the latter has dissolved and add 100 parts of crude hydrochloric acid, 20°. Agitate frequently and wash, after the previously brown mass has become light colored, with water, in which a little

chalk has been finely distributed, until the water is neutral. Finally filter over calcined Glauber's salt.

Adulteration of Linseed Oil.—This is common, and a simple and cheap method of testing is by nitric acid. Pour equal parts of the linseed oil and nitric acid into a flask, shake vigorously, and let it stand for 20 minutes. If the oil is pure, the upper stratum is of straw yellow color and the lower one colorless. If impure, the former is dark brown or black, the latter pale orange or dark yellow, according to the admixtures to the oil.

The addition of rosin oil to linseed oil or other paint oils can be readily detected by the increase in specific gravity, the low flash point, and the odor of rosin on heating; while the amount may be approximately ascertained from the amount of unsaponifiable oil left after boiling with caustic soda.

LIQUID OR COLD SOLDER:

These liquid solders consist merely of a quick drying lacquer to which has been added aluminum bronzing powder to give it the appearance of metal. The basis of such products have a variation of the following—

1 ounce butyl acetate
7 ounces ethyl and methyl acetate (7 ounces of each)
8 ounces benzol
3 ounces methyl alcohol
4½ ounces toluol
¾ ounce gum ester
2 ounces pyroxyline

4 to 5 ounces metal bronzing powder

Place all solids except bronzing powder in an airtight vessel and all the liquids and shake well until all are dissolved. Keep stopped at all times as the solution volatilizes very quickly. After all solids are dissolved add the bronzing powder and mix well to distribute the powder uniformly over the entire mass.

LOCUST KILLER:

See Insecticides.

LOUSE WASH:

See Insecticides.

Lubricants

Oil for Firearms.—Either pure vaseline oil, white, 0.870, or else pure white-bone oil, proof to cold, is employed for this purpose, since these two oils are not only free from acid, but do not oxidize or resinify.

Leather Lubricants.—Russian tallow, 1 pound; beeswax, 6 ounces; black pitch, 4 ounces; common castor oil, 3 pounds; soft paraffine, ½ pound; oil of citronella, ½ ounce. Melt all together in a saucepan, except the citronella, which add on cooling. Stir occasionally.

Machinery Oils.—I.—The solid fat, called bakourine, a heavy lubricant which possesses extraordinary lubricating qualities, has a neutral reaction and melts only at about 176° to 188° F. It is prepared as follows:

A mixture is made of 100 parts of Bienne petroleum or crude naphtha, with 25 parts of castor oil or some mineral oil, and subjected to the action of 60 or 70 parts of sulphuric acid of 66° Bé. The acid is poured in a small stream into the oil, while carefully stirring. The agitation is continued until a thick and blackish-brown mass is obtained free from non-incorporated petroleum. Very cold water of 2 or 3 times the weight of the mass is then added, and the whole is stirred until the mass turns white and becomes homogeneous. It is left at rest for 24 hours, after which the watery liquid, on the surface of which the fat is floating, must be poured off. After resting again from 3 to 4 days, the product is drawn off, carefully neutralized with caustic potash, and placed in barrels ready for shipping.

II.—Melt in a kettle holding 2 to 4 times as much as the volume of the mass which is to be boiled therein, 10 parts, by weight, of tallow in 20 parts of rape oil on a moderate fire; add 10 parts of freshly and well burnt lime, slaked in 30 or 40 parts of water; increase the fire somewhat, and boil with constant stirring until a thick froth forms and the mass sticks to the bottom of the kettle. Burning should be prevented by diligent stirring. Then add in portions of 10 parts each, gradually, 70 parts of rape oil and boil with a moderate fire, until the little lumps gradually forming have united to a whole uniform mass. With this operation it is of importance to be able to regulate the fire quickly. Samples are now continually taken, which are allowed to cool quickly on glass plates. The boiling down must not be carried so far that the samples harden on cooling; they must spin long, fine threads, when touched with the finger. When this point is reached add, with constant stirring, when the heat has abated sufficiently (which may be tested by pouring in a few drops of water), 25 to 30 parts of water. Now raise the fire, without

ceasing to stir, until the mass comes to a feeble, uniform boil. In order to be able to act quickly in case of a sudden boiling over, the fire must be such that it can be removed quickly, and a little cold water must always be kept on hand. Next, gradually add in small portions, so as not to disturb the boiling of the mass, 500 parts of paraffine oil (if very thick, 800 to 900 parts may be added), remove from the fire, allow the contents of the kettle to clarify, and skim off the warm grease from the sediment into a stirring apparatus. Agitate until the mass begins to thicken and cool; if the grease should still be too solid, stir in a little paraffine oil the second time. The odor of the paraffine oil may be disguised by the admixture of a little mirbane oil.

For Cutting Tools.—The proportion of ingredients of a lubricating mixture for cutting tools is 6 gallons of water, 3½ pounds of soft soap, and ½ gallon of clean refuse oil. Heat the water and mix with the soap, preferably in a mechanical mixer; afterwards add the oil. A cast-iron circular tank to hold 12 gallons, fitted with a tap at the bottom and having three revolving arms fitted to a vertical shaft driven by bevels and a fast and loose pulley, answers all requirements for a mixer. This should be kept running all through the working day.

For Highspeed Bearings.—To prevent heating and sticking of bearings on heavy machine tools due to running continuously at high speeds, take about ⅛ of flake graphite, and the remainder kerosene oil. As soon as the bearing shows the slightest indication of heating or sticking, this mixture should be forcibly squirted through the oil hole until it flows out between the shaft and bearing, when a small quantity of thin machine oil may be applied.

For Heavy Bearings.—An excellent lubricant for heavy bearings can be made from either of the following recipes:

I.—Paraffine	6	pounds
Palm oil	12	pounds
Oleonaphtha	8	pounds
II.—Paraffine	8	pounds
Palm oil	20	pounds
Oleonaphtha	12	pounds

The oleonaphtha should have a density of 0.9. First dissolve the paraffine in the oleonaphtha at a temperature of about 158° F. Then gradually stir in the palm oil a little at a time. The proportions will show that No. II gives a less liquid product than No. I. Quicklime may be added if desired.

For Lathe Centers.—An excellent lubricant for lathe centers is made by using 1 part graphite and 4 parts tallow thoroughly mixed.

Sewing Machine Oil.—I.—Petroleum oils are better adapted for the lubrication of sewing machines than any of the animal oils. Sperm oil has for a long time been considered the standard oil for this purpose, but it is really not well adapted to the conditions to which a sewing machine is subjected. If the machine were operated constantly or regularly every day, probably sperm oil could not be improved on. The difficulty is, however, that a family sewing machine will frequently be allowed to stand untouched for weeks at a time and will then be expected to run as smoothly as though just oiled. Under this kind of treatment almost any oil other than petroleum oil will become gummy. What is known in the trade as a "neutral" oil, of high viscosity, would probably answer better for this purpose than anything else. A mixture of 1 part of petrolatum and 7 parts of paraffine oil has also been recommended.

II.—Pale oil of almonds	9	ounces
Rectified benzoline	3	ounces
Foreign oil of lavender	1	ounce

PETROLEUM JELLIES AND SOLIDIFIED LUBRICANTS.

Petroleum jelly and petrolatum are different names for the same thing.

The pure qualities are made from American stock thickened with hot air until the desired melting point is attained. Three colors are made: white, yellow, and black of various qualities. Cheaper qualities are made by using ceresine wax in conjunction with the genuine article and pale mineral oil. This is the German method and is approved of by their pharmacopœia. Machinery qualities are made with cylinder oils, pale mineral oils, and ceresine wax.

I.—Yellow ceresine wax	11	parts
White ceresine wax	6	parts
American mineral oil, $\frac{203}{907}$	151	parts

Melt the waxes and stir in the oil. To make white, use all white ceresine wax. To color, use aniline dyes soluble in oil to any shade required.

II.—Ceresine wax	1	pound
Bloomless mineral oil, Sq. 910	1	gallon

Melt the wax and add the oil, varying according to the consistency required. To color black, add 28 pounds lampblack to 20 gallons oil. Any wax will do, according to quality of product desired.

White Petroleum Jelly.—

White tasteless oil	4 parts
White ceresine wax	1 part

Solidified Lubricants.—

I.—Refined cotton oil	2 parts
American mineral oil, $\frac{80}{90}$	2 parts
Oleate of alumina	1 part

Gently heat together.

II.—Petroleum jelly	120 parts
Ceresine wax	5 parts
Slaked lime	½ part
Water	4½ parts

Heat the wax and the petroleum jelly gently until liquid; then mix together the water and lime. Decant the former into packing receptacles, and add lime and water, stirring until it sets. For cheaper qualities use cream cylinder oil instead of petroleum jelly.

WAGON AND AXLE GREASES:

For Axles of Heavy Vehicles.—I.—Tallow (free from acid), 19½ parts; palm oil, 14 parts; sal soda, 5½ parts; water, 3 parts, by weight. Dissolve the soda in the water and separately melt the tallow, then stir in the palm oil. This may be gently warmed before adding, as it greatly facilitates its incorporation with the tallow, unless the latter be made boiling hot, when it readily melts the semi-solid palm oil. When these two greases are thoroughly incorporated, pour the mixture slowly into the cold lye (or soda solution), and stir well until the mass is homogeneous. This lubricant can be made less solid by decreasing the tallow or increasing the palm oil.

II.—Slaked lime (in powder), 8 parts, is slowly sifted into rosin oil, 10 parts. Stir it continuously to incorporate it thoroughly, and gently heat the mixture until of a syrupy consistency. Color with lampblack, or a solution of turmeric in a strong solution of sal soda. For blue grease, 275 parts of rosin oil are heated with 1 part of slaked lime and then allowed to cool. The supernatant oil is removed from the precipitated matter, and 5 or 6 parts of the foregoing rosin-oil soap are stirred in until all is a soft, unctuous mass.

For Axles of Ordinary Vehicles.—I.—Mix 80 parts of fat and 20 parts of very fine black lead; melt the fat in a varnished earthen vessel; add the black lead while constantly stirring until it is cold, for otherwise the black lead, on account of its density, would not remain in suspension in the melted fat. Axles lubricated with this mixture can make 80 miles without the necessity of renewing the grease.

II.—Mix equal parts of red American rosin, melted tallow, linseed oil, and caustic soda lye (of 1.5 density).

III.—Melt 20 parts of rosin oil in 50 parts of yellow palm oil, saponify this with 25 parts of caustic soda lye of 15° Bé., and add 25 parts of mineral oil or paraffine.

IV.—Mix residue of the distillation of petroleum, 60 to 80 parts; tallow, 10 parts; colophony, 10 parts; and caustic soda solution of 40° Bé., 15 parts.

A Grease for Locomotive Axles.—Saponify a mixture of 50 parts tallow, 28 parts palm oil, 2 parts sperm oil. Mix in soda lye made by dissolving 12 parts of soda in 137 parts of water.

MISCELLANEOUS LUBRICANTS:

For Cotton Belts.—Carefully melt over a slow fire in a closed iron or self-regulating boiler 250 parts of caoutchouc or gum elastic, cut up in small pieces; then add 200 parts of colophony; when the whole is well melted and mixed, incorporate, while carefully stirring, 200 parts of yellow wax. Then heat 850 parts of train oil, mixing with it 250 parts of talc, and unite the two preparations, constantly stirring, until completely cold.

Chloriding Mineral Lubricating Oils.—A process has been introduced for producing industrial vaselines and mineral oils for lubrication, based on the treatment of naphthas, petroleums, and similar hydrocarbides, by means of chlorine or mixtures of chlorides and hypochlorides, known under the name of decoloring chlorides. Mix and stir thoroughly 1,000 parts of naphtha of about 908 density; 55 parts of chloride of lime, and 500 parts of water. Decant and wash.

Glass Stop Cock Lubricant.—(See also Stoppers).

Pure rubber	14 parts
Spermaceti	5 parts
Petroleum	1 part

Melt the rubber in a covered vessel and then stir in the other ingredients. A little more petroleum will be required when the compound is for winter use.

Hard Metal Drilling Lubricant.—For drilling in hard metal it is recommended to use carbolic acid instead of another fatty substance as a lubricant, since the latter, by decreasing the friction, diminishes the "biting" of the drill, whereas the carbolic acid has an etching action.

Plaster Model Lubricant.—Take linseed oil, 1,000 parts; calcined lead, 50 parts; litharge, 60 parts; umber, 30 parts; talc, 25 parts. Boil for 2 hours on a moderate fire; skim frequently and keep in well-closed flasks.

Graphite Lubricating Compound.—Graphite mixed with tallow gives a good lubricating compound that is free from any oxidizing if the tallow be rendered free from rancidity. The proportions are: Plumbago, 1 part; tallow, 4 parts. The plumbago being stirred into the melted tallow and incorporated by passing it through a mixing mill, add a few pounds per hundredweight of camphor in powder to the hot compound.

Lubricants for Redrawing Shells.—Zinc shells should be clean and free from all grit and should be immersed in boiling hot soap water. They must be redrawn while *hot* to get the best results. On some shells hot oil is used in preference to soap water.

For redrawing aluminum shells use a cheap grade of vaseline. It may not be amiss to add that the draw part of the redrawing die should not be made too long, so as to prevent too much friction, which causes the shells to split and shrivel up.

For redrawing copper shells use good thick soap water as a lubricant. The soap used should be of a kind that will produce plenty of "slip." If none such is to be had, mix a quantity of lard oil with the soap water on hand and boil the two together. Sprinkling graphite over the shells just before redrawing sometimes helps out on a mean job.

Rope Grease.—For hemp ropes, fuse together 20 pounds of tallow and 30 pounds of linseed oil. Then add 20 pounds of paraffine, 30 pounds of vaseline, and 60 pounds of rosin. Finally mix with 10 pounds of graphite, first rubbed up with 50 pounds of boiled oil. For wire ropes fuse 100 pounds of suint with 20 pounds of dark colophony (rosin). Then stir in 30 pounds of rosin oil and 10 pounds of dark petroleum.

Sheet Metal Lubricant.—Mix 1 quart of whale oil, 1 pound of white lead, 1 pint of water, and 3 ounces of the finest graphite. This is applied to the metal with a brush before it enters the dies.

Steam Cylinder Lubricant.—To obtain a very viscous oil that does not decompose in the presence of steam even at a high temperature, it is necessary to expose neutral wool fats, that have been freed from wool-fatty acids, such as crude lanolin or wool wax, either quite alone or in combination with mineral oils, to a high heat. This is best accomplished in the presence of ordinary steam or superheated steam at a heat of 572° F., and a pressure of 50 atmospheres, corresponding with the conditions in the cylinder in which it is to be used. Instead of separating any slight quantities of acid that may arise, they may be dissolved out as neutral salts.

Wooden Gears.—An excellent lubricating agent for wooden gears consists of tallow, 30 parts (by weight); palm oil, 20 parts; fish oil, 10 parts; and graphite, 20 parts. The fats are melted at moderate heat, and the finely powdered and washed graphite mixed with them intimately by long-continued stirring. The teeth of wooden combs are kept in a perfectly serviceable condition for a much longer time if to the ordinary tallow or graphite grease one-tenth part of their weight of powdered glass is added.

TESTS FOR LUBRICANTS.

In testing lubricants in general, a great deal depends upon the class of work in which they are to be employed. In dealing with lubricating greases the specific gravity should always be determined. The viscosity is, of course, also a matter of the utmost importance. If possible the viscosity should be taken at the temperature at which the grease is to be subjected when used, but this cannot always be done; 300° F. will be found to be a very suitable temperature for the determination of the viscosity of heavy lubricants. Although one of the standard viscosimeters is the most satisfactory instrument with which to carry out the test, yet it is not a necessity. Provided the test be always conducted in exactly the same manner, and at a fixed temperature, using a standard sample for comparison, the form of apparatus used is not of great importance. Most dealers in scientific apparatus will provide a simple and cheap instrument, the results obtained with which will be found reliable. With the exercise of a little ingenuity any one can fit up a viscosimeter for himself at a very small outlay.

Acidity is another important point to

note in dealing with lubricating greases. Calculated as sulphuric acid, the free acid should not exceed .01 per cent, and free fatty acids should not be present to any extent. Cylinder oil should dissolve completely in petroleum benzine (specific gravity, .700), giving a clear solution. In dealing with machine oils the conditions are somewhat different. Fatty oils in mixture with mineral oils are very useful, as they give better lubrication and driving power, especially for heavy axles, for which these mixtures should always be used. The specific gravity should be from .900 to .915 and the freezing point should not be above 58° F. The flash point of heavy machine oils is not a matter of great importance. The viscosity of dynamo oils, taken in Engler's apparatus, should be 15–16 at 68° F. and 3½–4 at 122° F. In dealing with wagon oils and greases it should be remembered that the best kinds are those which are free from rosin and rosin products, and their flash point should be above 212° F.

To Test Grease.—To be assured of the purity of grease, its density is examined as compared with water; a piece of fat of the size of a pea is placed in a glass of water. If it remains on the surface or sinks very slowly the fat is pure; if it sinks rapidly to the bottom the fat is mixed with heavy matters and coom is the result.

LUBRICANTS FOR WATCHMAKERS:
See Watchmakers' Formulas.

LUPULINE BITTERS:
See Wines and Liquors.

LUSTER PASTE.

This is used for plate glass, picture frames, and metal. Five parts of very finely washed and pulverized chalk; 5 parts of Vienna lime, powdered; 5 parts of bolus, powdered; 5 parts of wood ashes, powdered; 5 parts of English red, powdered; 5 parts of soap powder. Work all together in a kneading machine, to make a smooth, even paste, adding spirit. The consistency of the paste can be varied, by varying the amount of spirit, from a solid to a soft mass.

LUTES:
See Adhesives.

MACHINE OIL:
See Lubricants.

MACHINERY, TO CLEAN:
See Cleaning Preparations and Methods.

MAGIC:
See Pyrotechnics.

MAGNESIUM CITRATE.

Magnesium carbonate	10	ounces
Citric acid	20	ounces
Sugar	21	ounces
Oil of lemon	½	drachm
Water enough to make	240	ounces

Introduce the magnesium carbonate into a wide-mouthed 2-gallon bottle, drop the oil of lemon on it, stir with a wooden stick; then add the citric acid, the sugar, and water enough to come up to a mark on the bottle indicating 240 ounces. For this purpose use cold water, adding about half of the quantity first, and the remainder when the substances are mostly dissolved. By allowing the solution to stand for a half to a whole day, it will filter better and more quickly than when hot water is used.

MAGNESIUM ORGEAT POWDER:
See Salts, Effervescent.

MAGNESIUM FLASH-LIGHT POWDERS:
See Photography.

MAGNETIC CURVES OF IRON FILINGS, THEIR FIXATION.

One of the experiments made in every physical laboratory in teaching the elements of magnetism and electricity is the production of the magnetic curves by sprinkling iron filings over a glass plate, after the well-known method.

For fixing these curves so that they may be preserved indefinitely, a plate of glass is warmed on the smooth upper surface of a shallow iron chest containing water raised to a suitable temperature by means of a spirit-lamp. A piece of paraffine is placed on the glass, and in the course of 3 or 4 minutes spreads itself evenly in a thin layer over the surface. The glass plate is removed, the surplus paraffine running off. The image is formed with iron filings on the cooled paraffine, which does not adhere to the iron, so that if the image is unsatisfactory the filings may be removed and a new figure taken. To fix the curves, the plate of glass is again placed on the warming stove. Finally, the surface of the paraffine is covered with white paint, so that the curves appear black on a white ground. Very well-defined figures may thus be obtained. A similar though much simpler process consists in covering one surface of stiff white paper with a layer of paraffine, by warming

over an iron plate, spreading the filings over the cooled surface, and fixing them with a hot iron or a gas flame.

MAGNOLIA METAL:
See Alloys.

MAHOGANY:
See Wood.

MALTED FOOD:
See Foods.

MALTED MILK:
See Milk.

MALT, HOT:
See Beverages.

MANGANESE ALLOYS:
See Alloys.

MANGANESE STEEL:
See Steel.

MANGE CURES:
See Veterinary Formulas.

MANICURE PREPARATIONS:
See Cosmeties.

MANTLES.

These are prepared after processes differing slightly from one another, but all based on the original formula of Welsbach—the impregnation of vegetable fibers with certain mineral oxides in solution, drying out, and arranging on platinum wire.

Lanthanum oxide...	30 parts
Yttrium oxide.....	20 parts
Burnt magnesia.....	50 parts
Acetic acid.....	50 parts
Water, distilled.....	100 parts

The salts are dissolved in the water, and to the solution another 150 parts of distilled water are added and the whole filtered. The vegetable fiber (in its knitted or woven form) is impregnated with this solution dried, and arranged on platinum wire. In the formula the acetic acid may be replaced with dilute nitric acid. The latter seems to have some advantages over the former, among which is the fact that the residual ash where acetic acid is used has a tendency to ball up and make a vitreous residue, while that of the nitric acid remains in powdery form.

Self-Igniting Mantles.—A fabric of platinum wire and cotton thread is sewed or woven into the tissue of the incandescent body; next it is impregnated with a solution of thorium salts and dried. The thorium nitrate in glowing gives a very loose but nevertheless fireproof residue. A mixture of thorium nitrate with platinic chloride leaves after incandescence a fire-resisting sponge possessing to a great extent the property of igniting gas mixtures containing oxygen. Employ a mixture of 1 part of thorium nitrate to 2½ parts of platinic chloride.

MANURES:
See Fertilizers.

MANUSCRIPT COPYING:
See Copying.

MAPLE:
See Wood.

MARASCHINO:
See Wines and Liquors

MARBLE CEMENTS:
See Adhesives.

MARBLE CLEANING:
See Cleaning Preparations and Methods.

MARBLE COLORS:
See Stone.

MARBLE ETCHING:
See Etching.

MARBLE, IMITATION:
See Plaster.

MARBLE, PAINTING ON:
See Painting.

MARBLE POLISHING:
See Polishes.

MARBLING CRAYONS:
See Crayons.

MARGERINE:
See Butter.

MARKING FLUID:
See also Inks and Etching.

For laying out work on structural iron or castings a better way than chalking the surface is to mix whiting with benzine or gasoline to the consistency of paint, and then apply it with a brush; in a few minutes the benzine or gasoline will evaporate, leaving a white surface ready for scribing lines.

MASSAGE APPLICATIONS:
See Cosmetics.

MASSAGE SOAPS:
See Soaps.

Matches

(See also Phosphorus.)

Manufacture of Matches.—Each factory uses its own methods and chemical mixtures, though, in a general way the latter do not vary greatly. It is impos-

sible here to give a full account of the different steps of manufacture, and of all the precautions necessary to turn out good, marketable matches. In the manufacture of the ordinary safety match, the wood is first comminuted and reduced to the final shape and then steeped in a solution of ammonium phosphate (2 per cent of this salt with 1 or 1½ per cent of phosphoric acid), or in a solution of ammonium sulphate (2½ per cent), then drained and dried. The object of this application is to prevent the match from continuing to glow after it has been burned out. Next the matches are dipped into a paraffine or stearine bath, and after that into the match bath proper, which is best done by machines constructed for the purpose. Here are a few formulas:

I.—Potassium chlorate	2,000 parts
Lead binoxide	1,150 parts
Red lead	2,500 parts
Antimony trisulphide	1,250 parts
Gum arabic	670 parts
Paraffine	250 parts
Potassium bichromate	1,318 parts

Directions: See No. II.

II.—Potassium chlorate	2,000 parts
Lead binoxide	2,150 parts
Red lead	2,500 parts
Antimony trisulphide	1,250 parts
Gum arabic	670 parts
Paraffine	250 parts

Rub the paraffine and antimony trisulphide together, and then add the other ingredients. Enough water is added to bring the mass to a proper consistency when heated. Conduct heating operations on a water bath. The sticks are first dipped in a solution of paraffine in benzine and then are dried. For striking surfaces, mix red phosphorus, 9 parts; pulverized iron pyrites, 7 parts; pulverized glass, 3 parts; and gum arabic or glue, 1 part, with water, quantity sufficient. To make the matches water or damp proof, employ glue instead of gum arabic in the above formula, and conduct the operations in a darkened room. For parlor matches dry the splints and immerse the ends in melted stearine. Then dip in the following mixture and dry:

Red phosphorus	3.0 parts
Gum arabic or tragacanth	0.5 parts
Water	3.0 parts
Sand (finely ground)	2.0 parts
Lead binoxide	2.0 parts

Perfume by dipping in a solution of benzoic acid.

III.—M. O. Lindner, of Paris, has patented a match which may be lighted by friction upon any surface whatever, and which possesses the advantages of being free from danger and of emitting no unpleasant odor. The mixture into which the splints are first dipped consists of

Chlorate of potash	6 parts
Sulphide of antimony	2 parts
Gum	1½ parts
Powdered clay	1½ parts

The inflammable compound consists of

Chlorate of potash	2 to 3 parts
Amorphous phosphorus	6 parts
Gum	1½ parts
Aniline	1½ parts

Red or amorphous is substituted for yellow phosphorus in the match heads. The composition of the igniting paste is given as follows:

	By weight
Soaked glue (1 to 5 of water)	37.0 parts
Powdered glass	7.5 parts
Whiting	7.5 parts
Amorphous phosphorus (pure)	10.0 parts
Paraffine wax	4.0 parts
Chlorate of potash	27.0 parts
Sugar or lampblack	7.0 parts

Silicate of soda may be substituted for the glue, bichromate of potash added for damp climates, and sulphur for large matches.

The different compositions for tipping the matches in use in different countries and factories all consist essentially of emulsions of phosphorus in a solution of glue or gum, with or without other matters for increasing the combustibility, for coloring, etc.

I.—English.—Fine glue, 2 parts, broken into small pieces, and soaked in water till quite soft, is added to water, 4 parts, and heated by means of a water bath until it is quite fluid, and at a temperature of 200° to 212° F. The vessel is then removed from the fire, and phosphorus, 1½ to 2 parts, is gradually added, the mixture being agitated briskly and continually with a stirrer having wooden pegs or bristles projecting at its lower end. When a uniform emulsion is obtained, chlorate of potassa, 4 to 5

parts; powdered glass, 3 to 4 parts; and red lead, smalt, or other coloring matter, a sufficient quantity (all in a state of very fine powder), are added, one at a time, to prevent accidents, and the stirring continued until the mixture is comparatively cool. The above proportions are those of the best quality of English composition. The matches tipped with it deflagrate with a snapping noise.

II. — German (Böttger). — Dissolve gum arabic, 16 parts, in the least possible quantity of water; add of phosphorus (in powder), 9 parts, and mix by trituration. Then add niter, 14 parts; vermilion or binoxide of manganese, 16 parts, and form the whole into a paste as directed above. Into this the matches are to be dipped, and then exposed to dry. As soon as they are quite dry they are to be dipped into very dilute copal varnish or lac varnish, and again exposed to dry, by which means they are rendered waterproof, or at least less likely to suffer from exposure in damp weather.

III. (Böttger.) — Glue, 6 parts, is soaked in a little cold water for 24 hours, after which it is liquefied by trituration in a heated mortar; phosphorus, 4 parts, is added, and rubbed down at a heat not exceeding 150° F.; niter (in fine powder), 10 parts, is next mixed in, and afterwards red ocher, 5 parts, and smalt, 2 parts, are further added, and the whole formed into a uniform paste, into which the matches are dipped, as before. This is cheaper than the previous one.

IV. (Diesel.)—Phosphorus, 17 parts; glue, 21 parts; red lead, 24 parts; niter, 38 parts. Proceed as above.

Matches tipped with II, III, or IV, inflame without fulmination when rubbed against a rough surface, and are hence termed noiseless matches by the makers.

Safety Paste for Matches.—The danger of explosion during the preparation of match composition may be minimized by addition to the paste of the following mixture: Finely powdered cork, 3 parts, by weight; oxide of iron, 15 parts; flour, 23 parts; and water, about 40 parts. In practice, 30 parts of gum arabic are dissolved in water, 40 parts, and to the solution are added powdered potassium chlorate, 57 parts, and when this is well distributed, amorphous phosphorus, 7 parts, and powdered glass, 15 parts, are stirred in. The above mixture is then immediately introduced, and when mixing is complete, the composition can be applied to wooden sticks which need not have been previously dried or paraffined. The head of the match is finally coated with tallow, which prevents atmospheric action and also spontaneous ignition.

Most chemists agree that the greatest improvement of note in the manufacture of matches is that of Landstrom, of Jonkoping, in Sweden. It consists in dividing the ingredient of the match mixture into two separate compositions, one being placed on the ends of the splints, as usual, and the other, which contains the phosphorus, being spread in a thin layer upon the end or lid of the box. The following are the compositions used: (*a*) For the splints: Chlorate of potassa, 6 parts; sulphuret of antimony, 2 to 3 parts; glue, 1 part. (*b*) For the friction surface: Amorphous phosphorus, 10 parts; sulphuret of antimony or peroxide of manganese, 8 parts; glue, 3 to 6 parts; spread thinly upon the surface, which has been previously made rough by a coating of glue and sand. By thus dividing the composition the danger of fire arising from ignition of the matches by accidental friction is avoided, as neither the portion on the splint nor that on the box can be ignited by rubbing against an unprepared surface. Again, by using the innocuous red or amorphous phosphorus, the danger of poisoning is entirely prevented.

MATCH MARKS ON PAINT, TO REMOVE:

See Cleaning Preparations and Methods.

MATCH PHOSPHORUS, SUBSTITUTE FOR:

See Phosphorus Substitute.

Matrix Masses

Matrix for Medals, Coins, etc.—I.—Sharp impressions of coins, medals, etc., are obtained, according to Böttger, with the following: Mix molten, thinly liquid sulphur with an equal quantity of infusorial earth, adding some graphite. If a sufficient quantity of this mass, made liquid over a flame, is quickly applied with a spatula or spoon on the coin, etc., an impression of great sharpness is obtained after cooling, which usually takes place promptly. Owing to the addition of graphite the articles do not become dull or unsightly.

II.—Bronze and silver medals should always be coated with a separating grease layer. The whole coin is greased slightly and then carefully wiped off again with a little wadding, but in such a manner

that a thin film of grease remains on the surface. Next, a ring of strong cardboard or thin pasteboard is placed around the edge, and the ends are sealed together. Now stir up a little gypsum in a small dish and put a teaspoonful of it on the surface of which the mold is to be taken, distributing it carefully with a badger's-hair brush, entering the finest cavities, which operation will be assisted by blowing on it. When the object is covered with a thin layer of plaster of Paris, the plaster, which has meanwhile become somewhat stiffer, is poured on, so that the thickness of the mold will be about $\frac{1}{10}$ of an inch. The removal of the cast can be effected only after a time, when the plaster has become warm, has cooled again, and has thoroughly hardened. If it be attempted to remove the cast from the metal too early and by the use of force, fine pieces are liable to break off and remain adhering to the model. In order to obtain a positive mold from the concave one, it is laid in water for a short time, so that it becomes saturated with the water it absorbs. The dripping, wet mold is again provided with an edge, and plaster of Paris is poured on. The latter readily flows out on the wet surface, and only in rare cases blisters will form. Naturally this casting method will furnish a surface of pure gypsum, which is not the case if the plaster is poured into a greased mold. In this case the surface of the cast contains a soapy layer, for the liquid plaster forms with oil a subsequently rather hard lime soap. The freshly cast plaster must likewise be taken off only when a quarter of an hour has elapsed, after it has become heated and has cooled again.

MATS FOR METALS:
See Metals.

MATZOON.

Add 2 tablespoonfuls of bakers' yeast to 1 pint of rich milk, which has been slightly warmed, stirring well together and setting aside in a warm room in a pitcher covered with a wet cloth for a time varying from 6 to 12 hours, according to the season or temperature of the room. Take from this, when curdled, 6 tablespoonfuls, add to another pint of milk, and again ferment as before, and continue for five successive fermentations in all, when the product will have become free from the taste of the yeast. As soon as the milk thickens, which is finally to be kept for use, it should be stirred again and then put into a refrigerator to prevent further fermentation. It should be smooth, of the consistence of thick cream, and of a slightly acid taste.

The milk should be prepared fresh every day, and the new supply is made by adding 6 tablespoonfuls of the previous day's lot to a pint of milk and proceeding as before.

The curd is to be eaten with a spoon, not drunk, and preferably with some bread broken into it. It is also sometimes eaten with sugar, which is said not to impair its digestibility.

MEAD.

In its best form Mead is made as follows: 12 gallons of pure, soft water (clean rain water is, next to distilled water, best) are mixed with 30 pounds of expressed honey in a big caldron, 4 ounces of hops added, and the whole brought to a boil. The boiling is continued with diligent skimming, for at least an hour and a half. The fire is then drawn, and the liquid allowed to cool down slowly. When cold, it is drawn off into a clean barrel, which it should fill to the bung, with a little over. A pint of fresh wine yeast or ferment is added, and the barrel put in a moderately warm place, with the bung left out, to ferment for from 8 to 14 days, according to the weather (the warmer it is the shorter the period occupied in the primary or chief fermentation). Every day the foam escaping from the bung should be carefully skimmed off, and every 2 or 3 days there should be added a little honey and water to keep the barrel quite full, and in the meantime a pan or cup should be inverted over the hole, to keep out dust, insects, etc. When fermentation ceases, the procedure varies. Some merely drive in the bung securely and let the liquor stand for a few weeks, then bottle; but the best German makers proceed as follows, this being a far superior process: The liquor is removed from the barrel in which it fermented to another, clean, barrel, being strained through a haircloth sieve to prevent the admission of the old yeast. A second portion of yeast is added, and the liquid allowed to pass through the secondary fermentation, lasting usually as long as the first. The bung is driven into the barrel, the liquid allowed to stand a few days to settle thoroughly and then drawn off into bottles and stored in the usual way. Some add nutmeg, cinnamon, etc., prior to the last fermentation.

MEASURES:
See Weights and Measures.

MEASURES, TO CLEAN:
See Cleaning Preparations and Methods.

MEAT EXTRACT CONTAINING ALBUMEN:
See Foods.

MEAT PEPTONOIDS:
See Peptonoids.

MEAT PRESERVATIVES:
See Foods.

MEAT PRODUCTS (ADULTERATED):
See Foods.

MEDAL IMPRESSIONS:
See Matrix Mass.

MEDALS, CLEANING AND PRESERVING:
See Cleaning Compounds.

MEDALLION METAL:
See Alloys.

MEDICINE DOSES:
See Doses.

MEERSCHAUM:

To Color a Meerschaum Pipe.—I.—Fill the pipe and smoke down about one-third, or to the height to which you wish to color. Leave the remainder of the tobacco in the pipe, and do not empty or disturb it for several weeks, or until the desired color is obtained. When smoking put fresh tobacco on the top and smoke to the same level. A new pipe should never be smoked outdoors in extremely cold weather.

II.—The pipe is boiled in a preparation of wax, 8 parts; olive oil, 2 parts; and nicotine, 1 part, for 10 or 15 minutes. The pipe absorbs this, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe; and its hue grows darker in proportion to the tobacco used. A meerschaum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible; rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw.

To Repair Meerschaum Pipes.—To cement meerschaum pipes, make a glue of finely powdered and sifted chalk and white of egg. Put a little of this glue on the parts to be repaired and hold them pressed together for a moment.

See also Adhesives under Cements.

To Tell Genuine Meerschaum.—For the purpose of distinguishing imitation meerschaum from the true article, rub with silver. If the silver leaves lead pencil-like marks on the mass, it is not genuine but artificial meerschaum. If no such lines are produced, the article is genuine.

MENTHOL COUGH DROPS:
See Confectionery.

MENTHOL TOOTH POWDER:
See Dentifrices.

MERCURY SALVES:
See Ointments.

MERCURY STAINS, TO REMOVE:
See Cleaning Preparations and Methods.

METACARBOL DEVELOPER:
See Photography.

Metals and Their Treatment

METAL CEMENTS:
See Adhesives and Lutes.

METAL CLEANING:
See Cleaning Preparations and Methods.

METAL INLAYING:
See Damaskeening.

METAL POLISHES:
See Polishes.

METAL PROTECTIVES:
See Rust Preventives.

METAL VARNISHES:
See Varnishes.

METALS, HOW TO ATTACH TO RUBBER:
See Adhesives, under Rubber Cements.

METALS, SECURING WOOD TO:
See Adhesives.

METALS, BRIGHTENING AND DEADENING, BY DIPPING:

Brightening Pickle.—To brighten articles by dipping, the dipping liquid must not be too hot, otherwise the pickled surface turns dull; neither must it be prepared too thin, nor must wet articles be entered, else only tarnished surfaces will be obtained.

For a burnish-dip any aqua fortis over 33° Bé., i. e., possessing a specific gravity of 1.30, may be employed. It is advisable not to use highly concentrated aqua fortis, to reduce the danger of obtaining matt work. It is important that the quantity of oil of vitriol, which is added,

is correct. It is added because the action of the aqua fortis is very uncertain. Within a short time it becomes so heated in acting on the metals that it turns out only dull work, and pores or even holes are apt to be the result of the violent chemical action. If the aqua fortis is diluted with water the articles do not become bright, but tarnish. For this reason sulphuric acid should be used. This does not attack the metals; it only dilutes the aqua fortis and distributes the heat generated in pickling over a larger space. It is also much cheaper, and it absorbs water from the aqua fortis and, therefore, keeps it in a concentrated state and yet distributed over the space.

In the case of too much oil of vitriol the dilution becomes too great and the goods are tarnished; if too little is added, the mixture soon ceases to turn out bright articles, because of overheating. On this experience are based the formulas given below.

Dip the articles, which must be free from grease, into the pickle, after they have been either annealed and quenched in diluted sulphuric acid or washed out with benzine. Leave them in the dipping mixture until they become covered with a greenish froth. Then quickly immerse them in a vessel containing plenty of water, and wash them out well with running water. Before entering the dipped articles in the baths it is well to remove all traces of acid, by passing them through a weak soda or potassium cyanide solution and washing them out again. If the brightly dipped goods are to remain bright they must be coated with a thin spirit or zapon acquer.

Following are two formulas for the pickle:

I.—Aqua fortis, 36° Bé., by weight.....	100	parts
Oil of vitriol (sulphuric acid), 66° Bé., by weight ..	70	parts
Cooking salt, by volume.....	1½	parts
Shining soot (lampblack), by volume.....	1½	parts
II.—Aqua fortis, 40° Bé., by weight.....	100	parts
Oil of vitriol, 66° Bé., by weight ...	100	parts
Cooking salt, by volume.....	2	parts
Shining soot, by volume.....	2	parts

Matting or Deadening Pickle.—When, instead of brilliancy, a matted appearance is desired for metals, the article is corroded either mechanically or chemically. In the first case it is pierced with fine holes near together, rubbed with emery powder or pumice stone and tamponned. In the other case the corrosion is effected in acid baths thus composed:

Nitric acid of 36° Bé., 200 parts, by volume; sulphuric acid of 56° Bé., 200 parts, by volume; sea salt, 1 part, by volume; zinc sulphate, 1 to 5 parts, by volume.

With this proportion of acids the articles can remain from 5 to 20 minutes in the mixture cold; the prominence of the matt depends on the length of time of the immersion. The pieces on being taken from the bath have an earthy appearance which is lightened by dipping them quickly in a brightening acid. If left too long the matted appearance is destroyed.

Cotton Matt.—This matt, thus called on account of its soft shade, is rarely employed except for articles of stamped brass, statuettes, or small objects. As much zinc is dissolved in the bath as it will take. The pieces are left in it from 15 to 30 minutes. On coming from the bath they are dull, and to brighten them somewhat they are generally dipped into acids as before described.

Silver Matt.—Articles of value for which gilding is desired are matted by covering them with a light coating of silver by the battery. It is known that this deposit is always matt, unless the bath contains too large a quantity of potassium cyanide. A brilliant silvering can be regularly obtained with electric baths only by adding carbon sulphide. Four drachms are put in an emery flask containing a quart of the bath fluid and allowed to rest for 24 hours, at the end of which a blackish precipitate is formed. After decanting, a quart is poured into the electric bath for each quart before every operation of silvering.

Dangers of Dipping.—The operation of dipping should be carried out only in a place where the escaping fumes of hyponitric acid and chlorine can pass off without molesting the workmen, e. g., under a well-drawing chimney, preferably in a vapor chamber. If such an arrangement is not present the operator should choose a draughty place and protect himself from the fumes by tying a wet sponge under his nose. The vapors are liable to produce very violent and dangerous inflammations of the respiratory organs, coming on in a surprisingly

quick manner after one has felt no previous injurious effect at all.

COLORING METALS:

See also Plating.

Processes by Oxidation.—By heat:—Coloration of Steel.—The steel, heated uniformly, is covered in the air with a pellicle of oxide and has successively the following colors: Straw yellow, blue (480° to 570° F.), violet, purple, water-green, disappearance of the color; lastly the steel reddens. For producing the blue readily, plunge the object into a bath of 25 parts of lead and 1 part of tin; its temperature is sufficient for bluing small pieces.

Bronzing of Steel.—I.—The piece to be bronzed is wet by the use of a sponge with a solution formed of iron perchloride, cupric sulphate, and a nitric acid. It is dried in a stove at 86° F., then kept for 20 minutes over boiling water. It is dried again at 86° F., and rubbed with a scratch brush.

This operation is repeated several times.

Bronzing of Steel.—II.—Rust and grease are removed from the objects with a paste of whiting and soda. They are immersed in a bath of dilute sulphuric acid, and rubbed with very fine pumice-stone powder. They are then exposed from 2 to 3 minutes to the vapor of a mixture of equal parts of concentrated chlorhydric and nitric acids.

The object is heated to 570° to 660° F. until the bronze color appears. When cooled, it is covered with paraffine or vaseline while rubbing, and heated a second time until the vaseline or paraffine commences to decompose. The operation is repeated. The shades obtained are beautiful, and the bronzing is not changeable. By subjecting the object to the vapors of the mixture of chlorhydric and nitric acids, shades of a light reddish brown are obtained. By adding to these two acids acetic acid, beautiful yellow bronze tints are procured. By varying the proportion of these three acids, all the colors from light reddish brown to deep brown, or from light yellow bronze to deep yellow bronze, are produced at will.

Bronzing.—III.—Under the name of Tuker bronze, a colored metal is found in trade which imitates ornamental bronze perfectly. It is obtained by deoxidizing or, if preferred, by burnishing cast iron. A thin layer of linseed oil or of linseed-oil varnish is spread on. It is heated at a temperature sufficient for producing in the open air the oxidation of the metal. The temperature is raised more or less, according as a simple yellow coloration or a deep brown is desired.

Lustrous Black.—In a quantity of oil of turpentine, sulphuric acid is poured drop by drop, stirring continually until a precipitate is no longer formed. Then the whole is poured into water, shaken, decanted, and the washing of the precipitate commenced again until blue litmus paper immersed in the water is no longer reddened. The precipitate will thus be completely freed from acid. After having drained it on a cloth, it is ready for use. It is spread on the iron and burned at the fire.

If the precipitate spreads with difficulty over the metal, a little turpentine can be added. It is afterwards rubbed with a linen rag, soaked with linseed oil, until the surface assumes a beautiful lustrous black. This covering is not liable to be detached.

Bluish Black.—Make a solution composed of nitric acid, 15 parts; cupric sulphate, 8 parts; alcohol, 20 parts; and water, 125 parts. Spread over the metal when well cleaned and grease removed. Dry and rub with linen rag.

Black.—Make a solution composed of cupric sulphate, 80 parts; alcohol, 40 parts; ferric chloride, 30 parts; nitric acid, 20 parts; ether, 20 parts; water, 400 to 500 parts, and pass over the object to be blackened.

Magnetic Oxide.—I.—A coating of magnetic oxide preserves from rust. To obtain it, heat the object in a furnace to a temperature sufficient to decompose steam. Then inject from 4 to 6 hours superheated steam at 1,100° F. The thickness of the layer of oxide formed varies with the duration of the operation. This process may replace zincking, enameling, or tinning.

II.—A deposit of magnetic oxide may be obtained by electrolysis. The iron object is placed at the anode in a bath of distilled water heated to 176° F. The cathode is a plate of copper, or the vessel itself if it is of iron or copper. By electrolysis a layer of magnetic oxide is formed.

In the same way other peroxides may be deposited. With an alkaline solution of litharge a brilliant black deposit of lead peroxide, very adherent, is obtained.

The employment of too strong a current must be avoided. It will produce a pulverulent deposit. To obtain a good coating, it is necessary after leaving the objects for a moment at the opposite

pole, to place them at the other pole until the outside is completely reduced, then bring them back to the first place.

Processes by Sulphuration.—**Oxidized Brown Color.**—The object is plunged into some melted sulphur mingled with lampblack, or into a liquid containing the flowers of sulphur mingled with lampblack. It is drained and dried. The bronzing obtained resists acids, and may acquire a beautiful polish which has the appearance of oxidized bronze, due perhaps to the formation of ferric sulphide, a sort of pyrites remarkable for its beautiful metallic reflections and its resistance to chemical agents.

Brilliant Black.—Boil 1 part of sulphur and 10 parts turpentine oil. A sulphurous oil is obtained of disagreeable odor. Spread this oil with the brush as lightly as possible, and heat the object in the flame of an alcohol lamp until the patina takes the tint desired. This process produces on iron and steel a brilliant black patina, which is extremely solid.

Blue.—Dissolve 500 drachms of hyposulphite of soda in 1 quart of water, and 35 grains of lead acetate in 1 quart of water. The two solutions mingled are heated to the boiling point. The iron is immersed, and assumes a blue coloration similar to that obtained by annealing.

Deposit of a Metal or of a Non-Oxidizable Compound.—**Bronze Color.**—Rub the iron smartly with chloride of antimony. A single operation is not sufficient. It is necessary to repeat it, heating the object slightly.

Black.—I.—Make a paste composed of equal parts of chloride of antimony and linseed oil. Spread on the object, previously heated, with a brush or rag; then pass over it a coating of wax and brush it. Finally varnish with gum lac.

II.—Prepare a solution of bismuth chloride, 10 parts; mercury chloride, 20 parts; cupric chloride, 10 parts; hydrochloric acid, 60 parts; alcohol, 50 parts; water, 500 parts. Add fuchsine in sufficient quantity to mask the color.

The mercury chloride is poured into the hydrochloric acid, and the bismuth chloride and cupric chloride added; then the alcohol. Employ this mixture with a brush or a rag for smearing the object. The object may also be immersed in the liquid if it is well cleaned and free from grease. It is dried and afterwards submitted to boiling water for half an hour. The operation is repeated until the wished-for tint is obtained; then the object is passed into the oil bath and taken to the fire without wiping. The object may also be placed for 10 minutes in boiling linseed oil.

Brown Tint.—A solution is made of chloride of mercury, 20 parts; cupric chloride, 10 parts; hydrochloric acid, 60 parts; alcohol, 50 parts; water, 500 parts. The object is plunged into this solution after being well cleaned. The solution may also be applied with a brush, giving two coats. It is afterwards put into hot water. The surface of the object is covered with a uniform layer of vegetable oil. It is placed in a furnace at a high temperature, but not sufficient for carbonizing the oil. The iron is covered with a thin layer of brown oxide, which adheres strongly to the metal, and which can be beautifully burnished, producing the appearance of bronze.

Brilliant Black.—The process begins by depositing on the object, perfectly clean and free from grease, a layer of metallic copper. For this purpose the following solutions are prepared: (*a*) Cupric sulphate, 1 part; water, 16 parts. Add ammonia until complete dissolution. (*b*) Chloride of tin, 1 part; water, 2 parts; and chlorhydric acid, 2 parts. The object is immersed in solution *b*, and afterwards in solution *a*. In this way there is deposited on the iron a very adherent coating of copper. The object, washed with water, is afterwards rubbed with sulphur, or immersed in a solution of ammonium sulphhydrate. A dull black coating of cupric sulphide is produced, which becomes a brilliant black by burnishing.

Blue Black.—The iron object is first heated according to the previous recipe, but the copper is converted into cupric sulphide, not by a sulphhydrate, but by a hyposulphite. It is sufficient to dip the coppered object into a solution of sodium hyposulphite, acidulated with chlorhydric acid, and raised to the temperature of 175° to 195° F.

Thus a blue-black coating is obtained, unchangeable in air and in water. After polishing, it has the color of blue steel. It adheres strongly enough to resist the action of the scratch brush.

Deposition of Molybdenum.—Iron is preserved from rust by covering it with a coating of molybdenum, as follows: Water, 1,000 parts; ammonium molybdate, 1 part; ammonium nitrate, 15 to 20 parts. Suspend the object at the negative pole of a battery. The current ought to have a strength of 2 to 5 amperes per cubic decimeter.

Deposit of Manganese Peroxide.—The

iron or steel is first covered with a coating of manganese peroxide by immersing as an anode in a bath containing about 0.05 per cent of chloride or sulphate of manganese and from 5 to 25 per cent of ammonium nitrate. The bath is electrolyzed cold, making use of a cathode of charcoal. Feeble currents (1 or 2 amperes) produce an adherent and unchangeable deposit.

Bronzing of Cannon.—Prepare a solution of ferric chloride of density 1.281, 14 parts; mercury chloride, 3 parts; fuming nitric acid, 3 parts; cupric sulphate, 3 parts; water, 80 parts. Give to the piece of ordnance 2 or 3 coatings of the solution, taking care always to scratch the preceding layer with a steel brush before spreading the second. Afterwards, the object is plunged in a solution of potassium sulphide in 900 parts of water. It is left in this for 10 days. It is removed by washing with soap and hot water. The object is rinsed, dried, and finally brushed with linseed-oil varnish.

Green Bronzing. — Dissolve 1 part of acetate of silver in 20 parts of essence of lavender; coat the surface of iron with this liquid by means of a brush and raise the temperature to 292° F. A brilliant green color is developed on the surface.

Coating on Steel Imitating Gilding.—The object is first covered by the galvanic method by means of a solution of cyanide of copper and potassium, then covered electrolytically with a thin deposit of zinc. It is dried and cleaned with a little washed chalk and finally immersed in boiling linseed oil. The surface of the piece after a few seconds, at a temperature of 310° F., appears as if there had been a real penetration of copper and zinc; that is to say, as though there were a formation of tombac.

Bronzing of Cast Iron.—The piece, when scraped, is coppered with the following bath: Cupric chloride, 10 parts; hydrochloric acid, 80 parts; nitric acid, 10 parts. It is rubbed with a rag and washed with pure water, and then rubbed with the following solution: Ammonium chlorhydrate, 4 parts; oxalic acid, 1 part; water, 30 parts.

Gilding of Iron and Steel.—Chloride of gold is dissolved either in oil of turpentine or in ether, and this solution is applied with the brush on the metallic surface, after being perfectly scraped. It is allowed to dry, and then heated more or less strongly for obtaining the necessary adherence. When it is dry the gilding is burnished.

Process by Deposit of a Color or Varnish.—Beautiful colorations, resistive to light, may be given to metals by the following method:

The metallic objects are immersed in a colorless varnish with pyroxyline, and dried in a current of hot air at 176° F. When the varnish is sufficiently dry, the objects are bathed for a few minutes in a 2 per cent alcoholic solution of alizarine or of a color of the same group. By washing with water the yellowish color covering the object on coming from the coloring bath passes to the golden red.

Coloring Copper.—To redden copper hang it from a few minutes to an hour, according to the shade wanted, in a 5 to 10 per cent solution of ferrocyanide of potassium in water. By adding a little hydrochloric acid to the solution the color given to the copper may be made to assume a purple shade. On removing the copper, dry it in the air or in fine sawdust, rinse, and polish with a brush or chamois leather, after drying it again.

Coloring Brass.—To redden brass, dip in solution of 5 ounces of sulphate of copper and 6 to 7 ounces of permanganate of potash in 500 ounces of water.

To blue copper or brass any one of the following recipes may be used:

I.—Dip the article in a solution of 2 ounces of liver of sulphur and 2 ounces of chlorate soda in 1,000 ounces of water.

II.—Dip the article in a solution of ferrocyanide of potassium very strongly acidulated with hydrochloric acid.

III.—Stir the article about constantly in a solution of liver of sulphur in 50 times its weight of water.

Fusion Point of Metals.—The point of fusion of common metals is as follows: Antimony, 808° F.; aluminum, 1,160° F.; bismuth, 517° F.; copper, 1,931° F.; gold, 1,913° F.; iron, 2,912° F.; lead, 850° F.; nickel, 2,642° F.; platinum, 3,225° F.; silver, 1,750° F.; tin, 551° F.; zinc, 812° F. Mercury, which is normally fluid, congeals at 38° below zero, F., this being its point of fusion.

To Produce Fine Leaves of Metal.—The metal plate is laid between parchment leaves and beaten out with hammers. Although films obtained in this manner reach a high degree of fineness, yet the mechanical production has its limit. If very fine films are desired the galvano-plastic precipitation is employed in the following manner:

A thin sheet of polished copper is entered in the bath and connected with the

electric conduit. The current precipitates gold on it. In order to loosen it, the gilt copper plate is placed in a solution of ferric chloride, which dissolves the copper and leaves the gold behind. In this manner gold leaf can be hammered out to almost incredible thinness.

METAL FOIL.

Tin foil is the most common foil used, being a combination of tin, lead, and copper, sometimes with properties of other metals.

	I	II	III
	Per cent	Per cent	Per cent
Tin	97.60	98.47	96.21
Copper	2.11	0.38	0.95
Lead	0.04	0.84	2.41
Iron	0.11	0.12	0.09
Nickel	....	....	0.30

I is a mirror foil; III is a tin foil.

Tin Foils for Capsules.—

	I	II
	Per cent	Per cent
Tin	20	22
Lead	80	77
Copper	..	1

Tin Foils for Wrapping Cheese, etc.—

	I	II	III
	Per cent	Per cent	Per cent
Tin	97	90	92
Lead	2.5	7.8	7
Copper	0.5	0.2	1

Tin Foils, for Fine Wrapping, I and II; for Tea Boxes, III.—

	I	II	III
	Per cent	Per cent	Per cent
Tin	60	65	40
Lead	40	35	58.5
Copper	..	..	1.5

Imitation Gold Foils.—

	Deep gold	Pure gold	Pale gold
	Per cent	Per cent	Per cent
Copper	84.5	78	76
Zinc	15.5	22	14

	Deep gold	Deep gold	Gold
	Per cent	Per cent	Per cent
Copper	91	86	83
Zinc	9	14	17
	reddish	dark yellow	pale yellow

Imitation Silver Foil.—Alloy of tin and zinc: harder than tin and softer than zinc: Zinc, 1 part; tin, 11 parts.

To Attach Gold Leaf Permanently.—Dissolve finely cut isinglass in a little water with moderate heat, which must not be increased to a boil, and add as much nitric acid as has been used of the isinglass. The adhesive will not penetrate the cardboard or paper.

MILDEW:

To Prevent Sails on Small Boats and Yachts from Mildewing.—To each gallon of water add ½ pound of slaked lime and allow this to stand for half an hour before using. In preparing a solution of lime water the important thing to do is to make certain that there is an excess of lime. Lime is only slightly soluble in water and it is necessary to make certain that the water has dissolved all the lime it is capable of doing. The sails are dipped in the lime water and allowed to dry. The process should be repeated each season.

MICROPHOTOGRAPHS

See Photography.

MILK:

See also Foods.

Determining Cream.—An apparatus for determining cream in milk consists of a glass cylinder having a mark about half its height, and a second mark a little above the first. The milk is added up to the lower mark, and water up to the second. The amount of water thus added is about one-fourth the volume of the milk, and causes the cream to rise more quickly. The tube is graduated between the two marks in percentages of cream on the undiluted milk. A vertical blue strip in the side of the cylinder aids the reading of the meniscus.

Formaldehyde in Milk, Detection of.—To 10 parts of milk add 1 part of fuchsine sulphurous acid. Allow to stand 5 minutes, then add 2 parts of pure hydrochloric acid and shake. If formaldehyde is not present, the mixture remains yellowish white, while if present a blue-violet color is produced. This test will detect 1 grain of anhydrous formaldehyde in 1 quart of milk.

Malted Milk.—To malt milk, add the following:

Powdered malt	1 ounce
Powdered oat meal	2 ounces
Sugar of milk	4 ounces
Roasted flour	1 pound

Milk Extracts.—These are made from skimmed milk freed from casein, sugar and albumen, and resemble meat extracts. The milk is slightly acidulated with phosphoric or hydrochloric acid, and evaporated *in vacuo* to the consis-

tency of thick syrup. During the crystallization of the sugar, the liquid is sterilized.

Modification of Milk for Infants.—For an ill child note the percentages of milk taken; decide, if indigestion is present, which ingredient of the milk, fat or proteid, or both, is at fault, and make formula accordingly.

After allowing the milk to stand 8 hours, remove the top 8 ounces from a quart jar of 4 per cent fat milk by means of a dipper, and count this as 12 per cent fat cream. Count the lowest 8 ounces of the quart fat-free milk. From these the following formula may be obtained, covering fairly well the different percentages required for the different periods of life.

First Week.

12 per cent cream. Fat-free milk.

Fat.....	2.00	Cream....	3¼ oz.
Sugar....	5.00	Milk.....	1½ oz.
Proteids..	0.75	Milk sugar	2 meas.

Second Week.

Fat.....	2.50	Cream....	4¼ oz.
Sugar....	6.00	Milk.....	1¼ oz.
Proteids..	1.00	Milk sugar	2½ meas.

Third Week.

Fat.....	3.00	Cream....	5 oz.
Sugar....	6.00	Milk.....	1 oz.
Proteids..	1.00	Milk sugar.	2½ meas.

Four to Six Weeks.

Fat.....	3.50	Cream....	5¾ oz.
Sugar....	6.50	Milk.....	1¾ oz.
Proteids..	1.00	Milk sugar	2½ meas.

Six to Eight Weeks.

Fat.....	3.50	Cream....	5¾ oz.
Sugar....	6.50	Milk.....	3¼ oz.
Proteids..	1.50	Milk sugar	2¼ meas.

Two to Four Months.

Fat.....	4.00	Cream....	6¾ oz.
Sugar....	7.00	Milk.....	2¼ oz.
Proteids..	1.50	Milk sugar	2½ meas.

Four to Eight Months.

Fat.....	4.00	Cream....	6¾ oz.
Sugar....	7.00	Milk.....	4¾ oz.
Proteids..	2.00	Milk sugar	2¼ meas.

Eight to Nine Months.

Fat.....	4.00	Cream....	6¾ oz.
Sugar....	7.00	Milk.....	7½ oz.
Proteids..	2.50	Milk sugar	2 meas.

Nine to Ten Months.

Fat.....	4.00	Cream....	6¾ oz.
Sugar....	7.00	Milk.....	10½ oz.
Proteids..	3.00	Milk sugar	1½ meas.

Ten to Twelve Months.

Fat.....	4.00	Cream....	6¾ oz.
Sugar....	5.00	Milk.....	11¾ oz.
Proteids..	3.50	Milk sugar	½ meas.

After Twelve Months.

Unmodified cow's milk.

Pasteurization of Milk.—In order to make milk safe for human consumption it is necessary to destroy any harmful bacteria which may be present. By far the most widely used method is one of heat treatment or pasteurization named after its inventor Pasteur.

There are two methods of pasteurizing milk, one known as the "flash" process and the other the "holder" process.

In the first method the milk is heated to a temperature of 160 to 165° F. for about 1 minute, cooled to about 40° F., bottled and placed in refrigerator. In the "holder" process the milk is heated and kept at a temperature of about 140° F. for 30 minutes, cooled as before and bottled.

Pasteurized milk is less easily digested by infants as the enzymes which it contains are destroyed.

The second method is preferable in that the milk does not acquire the "cooked" taste and the enzymes are not as readily destroyed as in the "flash" method which uses a higher temperature.

Milk Substitute.—Diamalt is a thick syrupy mass of pleasant, strong, somewhat sourish odor and sweetish taste, which is offered as a substitute for milk. The preparation has been analyzed. Its specific gravity is 1.4826; the percentage of water fluctuates between 24 and 28 per cent; the amount of ash is 1.3 per cent. There are present: Lactic acid, 0.718 to 1.51; nitrogenous matter, 4.68 to 5.06 per cent; and constituents rich in nitrogen, about 68 per cent. The latter consist principally of maltose. Dissolved in water it forms a greenish-yellow mixture. Turbidness is caused by starch grains, yeast cells, bacteria, and a shapeless coagulum.

MILK AS A SUBSTITUTE FOR CELLULOID, BONE, AND IVORY:
See Casein.

MILK, CUCUMBER:
See Cosmetics.

MILK OF SOAP:
See Cleaning Preparations and Methods, under Miscellaneous Methods.

MINARGENT:
See Alloys.

MINERAL WATERS:
See Waters.

MINOFOR METAL:
See Alloys.

MINT CORDIAL:
See Wines and Liquors.

Mirrors

(See also Glass.)

Mirror Silvering.—Mirror silvering is sometimes a misnomer, inasmuch as the coating applied to glass in the manufacture of mirrors does not always contain silver. In formula I it is an amalgam of mercury and tin.

I.—A sheet of pure tin foil, slightly larger than the glass plate to be silvered, is spread evenly on a perfectly plane stone table having a raised edge, and is well cleaned from all dust and impurity. The foil must be free from the slightest flaw or crack. The tin is next covered uniformly to a depth of $\frac{1}{8}$ of an inch with mercury, preference being given by some to that containing a small proportion of tin from a previous operation. The glass plate, freed from all dust or grease, and repolished if necessary, is then carefully slid over the mercury. This part of the work requires skill and experience to exclude all air bubbles, and even the best workmen are not successful every time. If there is a single bubble or scratch the operation must be repeated and the tin foil is lost; not a small expense for large sizes. When this step has been satisfactorily accomplished the remainder is easy. The glass plate is loaded with heavy weights to press out the excess of mercury which is collected and is used again. After 24 hours the mirror is lifted from the table and placed on edge against a wall, where it is left to drain well.

II.—Solution No. 1 is composed as follows: To 8 ounces of distilled water, brought to a boil, add 12 grains of silver nitrate and 12 grains of Rochelle salts. Let it come to a boil for 6 to 7 minutes; then cool and filter.

Solution No. 2 is made as follows: Take 8 ounces of distilled water, and into a small quantity poured into a tumbler put 19 grains of silver nitrate. Stir well until dissolved. Then add several drops of 26° ammonia until the solution becomes clear. Add 16 grains more of nitrate of silver, stirring well until dissolved. Add balance of distilled water and filter. The filtering must be done through a glass funnel, in which the filter paper is placed. The solution must be stirred with a glass rod. Keep the solutions in separate bottles marked No. 1 and No. 2.

Directions for Silvering: Clean the glass with ammonia and wipe with a wet chamois. Then take half and half of the two solutions in a graduating glass, stirring well with a glass rod. Pour the contents on the middle of the glass to be silvered. It will spread over the surface of itself if the glass is laid flat. Leave it until the solution precipitates.

Silvering Globes.—The insides of globes may be silvered, it is said, by the following methods:

I.—Take $\frac{1}{3}$ ounce of clean lead, and melt it with an equal weight of pure tin; then immediately add $\frac{1}{2}$ ounce of bismuth, and carefully skim off the dross; remove the alloy from the fire, and before it grows cold add 5 ounces of mercury, and stir the whole well together; then put the fluid amalgam into a clean glass, and it is fit for use. When this amalgam is used for silvering, it should be first strained through a linen rag; then gently pour some ounces of it into the globe intended to be silvered; the alloy should be poured into the globe by means of a paper or glass funnel reaching almost to the bottom of the globe, to prevent it splashing the sides; the globe should be turned every way very slowly, to fasten the silvering.

II.—Make an alloy of 3 ounces of lead, 2 ounces of tin, and 5 ounces of bismuth. Put a portion of this alloy into the globe and expose it to a gentle heat until the compound is melted; it melts at 197° F.; then by turning the globe slowly round, an equal coating may be laid on, which, when cold, hardens and firmly adheres.

Resilvering Mirrors—If mirrors coated with amalgam become damaged they may sometimes be successfully repaired by one of the following processes:

I.—Place the old mirror in a weak solution of nitric acid—say 5 per cent—which immediately removes the silver. Rinse it a little, and then clean very thoroughly with a pledget of cotton-wool and a mixture of whiting and ammonia. Rouge will answer in place of whiting, or, as a last extreme, finest levigated pumice, first applied to a waste glass to crush down any possible grit. This cleaning is of the utmost importance, as upon its thoroughness depends eventual success. Front, back, and edges must alike be left in a state above suspicion. The

plate is then again flowed with weak acid, rinsed under the tap, then flowed back and front with distilled water, and kept immersed in a glass-covered dish of distilled water until the solutions are ready.

The depositing vessel is the next consideration, and it should be realized that unless most of the silver in the solution finds its way on to the face of the mirror it were cheaper that the glass should be sent to the professional mirror-maker. The best plan is to use a glass dish allowing a $\frac{1}{16}$ inch margin all round the mirror, inside. But such a glass dish is expensive, having to be made specially, there being no regular sizes near enough to 4 x 7 or 8 x 5 (usual mirror sizes). If too large, a dish must perforce be used, the sides or ends of which should be filled up with sealing wax. Four strips of glass are temporarily bound together with 2 or 3 turns of string, so as to form a hollow square. The side pieces are $\frac{1}{8}$ inch longer outside, and the end pieces $\frac{1}{8}$ inch wider than the mirror glass. This frame is placed in about the center of the dish, moistened with glycerine, and the molten wax flowed outside of it to a depth of about $\frac{3}{4}$ of an inch or more. For economy's sake, good "parcel wax" may be used, but best red sealing wax is safer. This wax frame may be used repeatedly, being cleaned prior to each silvering operation. It is the only special appliance necessary, and half an hour is a liberal time allowance for making it.

Use a stock solution of silver nitrate of the strength of 25 grains to 1 ounce of distilled water: Take 2 drachms of silver nitrate stock solution and convert it to ammonia nitrate, by adding ammonia drop by drop until the precipitate is redissolved. Add 3½ ounces of distilled water.

In another measure take 80 drops (approximatcly 74 minims) of 40 per cent formalin. Pour the solution of ammonio nitrate of silver into the measure containing the formalin, then back into the original measure, and finally into the dish containing the glass to be silvered. This should be done rapidly, and the dish containing the mirror well rocked until the silvering is complete, which may be ascertained by the precipitation of a black, flocculent deposit, and the clearing of the solution. The actual process of silvering takes about 2 minutes.

Cleanliness throughout is of the greatest importance. The vessels in which the solutions are mixed should be well rinsed with a solution of bichromate of potash and sulphuric acid, then washed out three or four times under the tap, and finally with distilled water. For cleansing, dip the glass for a short time in a solution of bichromate of potash, to which a little sulphuric acid is added. The glass is afterwards well rinsed for a minute or two under the tap, flooded with distilled water, and dried with a clean linen cloth. A little absolute alcohol is then rubbed on with a soft linen handkerchief, which is immediately rolled into a pad and used for well polishing the surface. The cleaning with alcohol is repeated to avoid risk of failure.

After the mirror has been silvered, hold it under the tap and allow water to flow over it for about 3 minutes. Rinse it with distilled water, and stand it up on edge on blotting paper. When it is quite dry take a pad of very soft washleather, spread a small quantity of finest opticians' rouge on a sheet of clean glass, and well coat the pad with rouge by polishing the sheet of glass. A minute quantity of rouge is sufficient. Afterwards polish the mirror by gently rubbing the surface with the pad, using a circular stroke.

It will be seen that with this process it is unnecessary to suspend the mirror in the silvering solution, as usually recommended. The mirror is laid in the dish, which is a distinct advantage, as the progress of the silvering may be watched until complete. The film also is much more robust than that obtained by the older methods.

II.—Clean the bare portion of the glass by rubbing it gently with fine cotton, taking care to remove any trace of dust and grease. If this cleaning be not done very carefully, defects will appear around the place repaired. With the point of a penknife cut upon the back of another looking glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may be now lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton; it hardens almost immediately, and the glass presents the same appearance.

Clouding of Mouth Mirrors.—By means of the finger, slightly moistened, apply a film of soap of any brand or kind to the mirror; then rub this off with a clean, dry cloth; the mirror will be as

bright and clear as ever. Breathing on it will not affect its clearness and the mirror does not suffer from the operation.

Magic Mirrors. — Among the many amusing and curious articles which the amateur mechanic can turn out, metallic mirrors having concealed designs on them, and which can be brought into view by breathing on the polished surface, are both funny and easy to produce. To produce steel mirrors either tough bronze or good cast mottled iron discs should be used, and the design should be on the bottom of the cast disc, as this is the soundest and densest part of the metal. The method of working is different with bronze and iron, and bronze will be dealt with first.

The cast disk of bronze should be turned up level on both sides, and the edges should be turned or shaped up, the metal being about half an inch thick. On the side which was at the bottom in casting, a line should be drawn to allow for working up the border or frame of the mirror, and on the rest of the smooth surface the design should be drawn, not having too much detail. It is best to mark the lines with a sharp scriber, to prevent their effacement during working. When the disk is marked out, it should be laid on a smoothly planed iron block, and the lines punched to a depth of about ¼ inch, a punch with round edges being used. Then the disk should be turned down to just below the surface of the punched-in metal, and the border or edge formed, finishing smoothly, but without burnishing. The back can be turned down and, with the outer edge, burnished; but the inside of the edge and the face of the mirror should be polished with fine abrasive powder, and finished with fine rouge. When dry, the mirror will appear equally bright all over; but when breathed on the design will show, again disappearing as the moisture is removed. The metal punched in will be more dense than the rest of the surface, and will also be very slightly raised, this being imperceptible unless the polishing has been too long continued.

With iron mirrors a good mottled iron must be used, selecting hematite for preference; but in any case it must be chillable metal. Preferably it should be melted in a crucible, as this causes the least change in the metallic content, and as the metal can be made hot and fluid, it works well. The design must be worked out in iron of about ⅛ inch in thickness, and must be level, as it has to touch the molten metal in the bottom of the mold. If preferred, the design may be cast and ground flat, but this depends largely on the design. The chill pattern should be coated with plumbago, and in molding the disk pattern of about ¼ inch in thickness should be laid on a board, and on this the design—chill—should be placed, and the mold should be rammed up from the back in the ordinary manner. The casting should be allowed to get cold in the mold, and should then be removed and dressed in the usual way. It should then be ground bright all over on emery wheels of successively finer grades, and the mirror surface should be buffed and polished until a steely mirror surface is produced. With a good mottled iron the chilled design will not show until the surface is breathed on or rubbed with a greasy rag, but will then show clearly.

MIRROR ALLOYS:
See Alloys.

MIRRORS, FROSTED:
See Glass.

MIRROR-LETTERING:
See Lettering.

MIRROR POLISHES:
See Polishes.

MIRRORS, TO CLEAN:
See Cleaning Preparations and Methods.

MIRRORS, TO PREVENT DIMMING OF:
See Glass.

MIRROR VARNISH:
See Varnishes.

MITE KILLER:
See Insecticides.

MIXING STICKS FOR PAINT:
See Paint.

MODELING WAX:
See Wax, Modeling.

MOISTURE:
See Insulation.

MOLDS:
See also Casting and Matrix.

Molding Sand.—A high grade of molding sand should be fat, i. e., strongly mixed with clay. Naturally the molds of this sand should be employed only in a perfectly dry state. The fat molding sand is prepared artificially from quartz sand (fine sprinkling sand), fat clay, free

from lime and ferric oxide (red ocher). The molding sand is fixed by breaking up the loose pieces in which it is partly dug; next it is passed through a fine sieve and mixed up to one-third of its volume with charcoal dust, or, better still, with lampblack, which, owing to its looseness and fatness, does not detract so much from the binding qualities of the sand. The utility of the sand may be tested by pressing the finger into it, whereupon the fine lines of the skin should appear sharply defined; its binding power is ascertained by dropping a lump pressed together with the hand from a height, which is increased until it breaks.

MOLDS OF PLASTER:

See Plaster.

MOLES:

See also Warts.

Lunar caustic is frequently used to remove warts and moles. It should be wrapped in tin foil or placed in a quill so that it will not touch the bare flesh. Moisten the raised surface and touch with the caustic night and morning. Successive layers of skin will dry up and peel off. When on a level with the surrounding flesh apply a healing ointment. Let the last crust formed drop without touching it. Unless carefully done this process may leave a white scar.

A simple remedy for warts consists in wetting and rubbing them several times a day in a strong solution of common washing soda. The electric treatment, however, is now the most popular.

MORDANTS:

See also Dyes.

Mordant for Cement Surfaces.—Take green vitriol and dissolve it in hot water. If the cement is rather fresh add 1 part of vinegar for each part of green vitriol. Best suited, however, is triple vinegar (vinegar containing $\frac{1}{13}$ per cent of acetic acid), which is alone sufficient for well-dried places. For such surfaces that have been smoothed with a steel tool and have hardly any pores, take alcohol, 1 part, and green vitriol, 10 parts, and apply this twice until the iron has acquired a yellowish color. This mordant forms a neutral layer between cement and paint, and causes the latter to dry well.

Mordant for Gold Size.—A mordant for gold size gilding that has been thoroughly tested and found to be often preferable to the shellac-mixed article, is prepared from yolk of egg and glycerine. The yolk of an egg is twirled in a cup and up to 30 drops of glycerine are added to it. The more glycerine added, the longer the mordant will take to dry. Or else an equal portion of ordinary syrup is mixed with the yolk of egg. Same must be thinly liquid. If the mass becomes too tough it is warmed a little or thinned with a few drops of warm water. A single application is sufficient. Naturally, this style of gilding is only practicable indoors; it cannot withstand the influence of moisture.

MORTAR, ASBESTOS.

Asbestos mortar consists of a mixture of asbestos with 10 per cent of white lime. Canadian asbestos is generally used, which is composed of 80 per cent of asbestos and 20 per cent of serpentine. The asbestos is ground and the coarse powder used for the first rough cast, while the finer material is employed for the second top-plastering. This mortar is highly fire-resisting and waterproof, is only half as heavy as cement mortar, and tough enough to admit of nails being driven in without breaking it.

MOUNTANTS:

See also Adhesive and Photography.

Mounting Drawings, Photos, etc., upon Fine Pasteboard.—It frequently happens that the pasteboard will warp toward the face of the picture, even if left in a press till the gluing medium is perfectly dry. This fault can be obviated by moistening the back of the pasteboard moderately with a sponge, and, while this is still wet, pasting the picture on with good, thin glue. If moistening the pasteboard is impracticable (with sensitive drawings, paintings, etc.), paste which has been pressed through a fine cloth is rubbed on, always in the same direction, and the picture is carefully and evenly pressed on. Then bend the pasteboard backward in a wide semicircle, and place it between two heavy objects on the table. After a few hours, when the paste is completely dry, put the picture down flat and load proportionately. Papers of large size, which cannot conveniently be placed between two objects, are wrapped up, and twine is stretched around, thus keeping them bent.

Mounting Prints on Glass.—Take 4 ounces of gelatin; soak ½ hour in cold water; then place in a glass jar, adding 16 ounces of water; put the jar in a large dish of warm water and dissolve the gelatin. When dissolved pour in a shallow tray; have the prints rolled on a roller, albumen side up; take the print by the corners and pass rapidly through the gelatin, using great care to avoid air bubbles. Squeeze carefully onto the glass. The better the quality of glass, the finer the effect.

MUD CREAM — COMPLEXION CLAY:

I. Mix well together the following:

4 ounces powdered and sifted modelling clay
1 ounce calamine powder
½ ounce of oxide of zinc
¼ ounce of infusorial earth
7 grains benzoate of soda (rubbed to a fine powder)

These ingredients are sifted and rubbed to a fine powder in a mortar and pestle and worked to make a uniform thick paste with the addition of two ounces of witch hazel, one ounce of glycerine and sufficient water to obtain the desired consistency. The container should be sealed to avoid contact with the air.

DIRECTIONS FOR USING THE MUD PACK:

Massage the face lightly with cold cream and wipe off before applying the pack. The pack can be left on the face until it has hardened like a mask. Then remove it gently with the aid of warm water and a soft wash cloth. After this apply gently, a good cold cream to sooth the skin. A face pack can be used about three times a week with good results.

II.

14 ounces powdered Fuller's earth
6 drachms glycerine
6 ounces and 6 drachms tincture of benzoin
3 drachms petitgrain oil
4 ounces water (or enough to make a paste)

III.

2 pounds Fuller's earth
1 ounce Kaolin
1 drachm benzoate of soda
4 ounces distilled water
10 ounces greaseless cream
25 drops perfume oil

Dissolve the benzoate of soda in the water (heated to about 180° F). To the Fuller's earth add the perfume oil, drop by drop, mixing it well. Then add the benzoate of soda solution to the Fuller's earth and Kaolin mixture and if necessary, add a little more water to make it into a thick paste. To this add about ¼ as much greaseless cream as you have paste and then mix thoroughly.

IV.

4 ounces magnesium sulphate
2 ounces powdered alum
2 drachms menthol crystals
28 ounces Kaolin
4 ounces glycerine
2 ounces hydrogen peroxide
Juice from four medium sized lemons
1 pint distilled water

Dissolve the magnesium sulphate, powdered alum and menthol crystals in the distilled water (heat a little). Mix well together the other ingredients. Gradually add the first mixture and bring the whole to a boil. Remove then from fire and add if desired about 25 drops of a perfume oil. If the mixture is too thick it can have hot water added to it to thin.

V. Mix together until they form a paste:

5 teaspoonfuls Fuller's earth
3 tablespoonfuls lemon juice

Cleanse the face either with cold cream or warm water, then spread the paste evenly over the face, chin and neck and let it remain on about fifteen minutes, then moisten absorbent cotton in warm water and remove the mask. After this the face should be gone over with a lump of ice held in a clean, white linen handkerchief. This tonic smoothes out lines, also clears and softens the skin.

MUSTACHE FIXING FLUID:

Balsam of Tolu ..... 1 part
Rectified spirit ..... 3 parts
Jockey club ..... 1 part

Dissolve the balsam in the liquids. Apply a few drops to the mustache with a brush, then twist into the desired shape.

MUSTARD PAPER:

I.—India rubber..... 1 part
Benzol ..... 49 parts
Black mustard in powder, a sufficiency.

Dissolve the India rubber in the benzol, then stir in the mustard until the mixture is of a suitable consistence for spreading. It was further recommended to remove the fixed oil from the mustard by percolation with benzol. Mustard paper thus made is of good quality, very active, and keeps well.